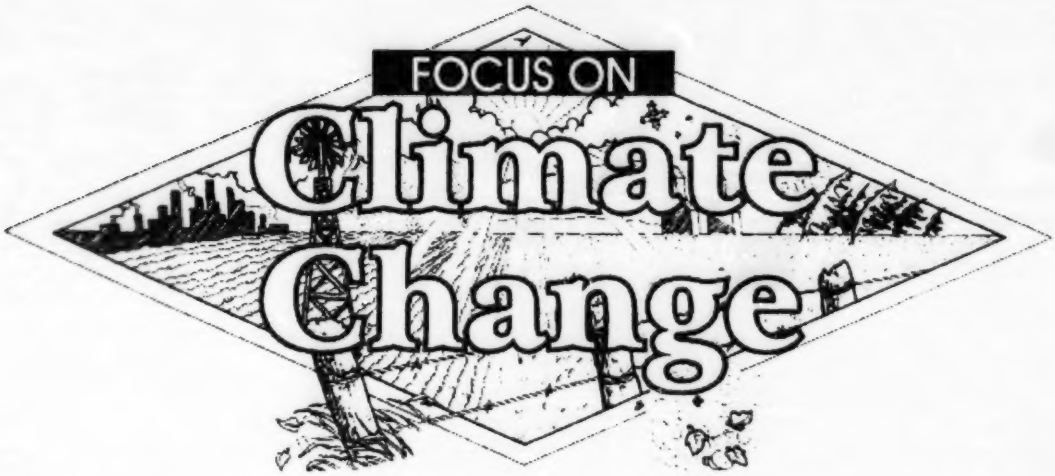

What is climate change ... and why we should care?

Climate change is a term that has been in the news a great deal over the last several years. But what is climate change and should we be concerned?

We should first consider the difference between climate and weather. Weather is what is happening in the atmosphere at any given time. Climate is a long-term look at weather or "average weather". In Canada, we use a minimum of 30 years to establish a climate record, or "*normal*", for a location. The climate for a location gives a "snapshot" of what weather you might expect.

Climate Normal – The average temperature expected for a given day and location based on the weather records of that location.

The study of climate allows us to look for long-term trends in our weather. Questions such as, "is it getting colder, warmer, wetter, drier?" can be examined by studying the climate records. We sometimes mistake individual weather events, or even an abnormal season, as an indicator of climate change. We have to look for the long-term trends in weather and not just at individual events to try and tell if our climate is changing.

Is our climate changing?

It might be better to ask if our climate is the same today as it was in the past. The weather records in Alberta go back a little over 100 years. While these records show some trends, this is only a small glimspe of what our past climate and weather were like.

To construct the climate before we started keeping weather records, we have to use other evidence for climate. In the near past, we can use the writings of the explorers, surveyors and pioneers to get a sense of our past climate. Their descriptions of life in early times often contain references to the weather events of the day.

To go back further than the first settlers and their written records, we can study tree rings and lake sediments to gauge past temperatures and precipitation. For even longer records, scientists can study the gases found in drill cores from glaciers and ice sheets to

construct what our climate looked like in the past. From these sources and others, climate scientists have been able to construct a record of our past climate.

What we know is that our climate has varied in the past. We know that when the climate was colder a sheet of ice covered Alberta approximately 10 000 to 15 000 years ago. We also know that there has been several periods of glaciers over the last 100 000 years. This tells us that the Earth's climate varies naturally.

Over the last 1 000 years, the record shows the same variations. Approximately 1 000 years ago the climate was relatively warm. It was warm enough to allow the Vikings to cross the North Atlantic and create settlements in Greenland and Labrador. We also know that several hundred years later they had to abandon their settlements when the climate became colder and made it impossible for people to survive in those areas.

About 400 years ago there was a period of colder weather known as the 'Little Ice Age'. While it was not cold enough to start the glaciers marching across the prairies, it was cold enough that people in London, such as Samuel Pepys, reported that the River Thames froze solid.

There are many theories that try to explain the natural variation in our climate. However, this is a very difficult question to answer. The climate system is incredibly complex and there are a huge number of factors that are thought to influence our climate.

Enhanced Greenhouse Effect – The addition of human-produced greenhouse gases into the atmosphere. These additional concentrations of greenhouse gases may trap more heat into the atmosphere and so warm the earth.

What is the greenhouse effect?

The greenhouse effect is the natural process that warms our atmosphere and allows for life on Earth. As in a greenhouse, most of the energy from the sun passes through the atmosphere as if it were transparent. The energy is absorbed by the surface of the Earth and then radiated back into the atmosphere as heat. Much of the heat is then trapped by the so-called "greenhouse gases" in the atmosphere. This is the process that keeps the Earth at an average temperature of +15°C. If we did not have the natural greenhouse effect, the average temperature of the Earth would be -18°C - a difference of 33°! Without the natural greenhouse effect, life would not exist on Earth as we know it.

To put this into perspective, we need only look at our planetary neighbours, Venus and Mars. Venus contains an atmosphere that is 96.5% carbon dioxide. The temperature on the surface of Venus is +750°C. On Mars there is very little atmosphere to hold the heat that is released by the planet. The surface temperature of Mars ranges from -120°C to -30°C. As in the three bears, our atmosphere is just right!

The main gases that trap heat in the atmosphere are water vapour, carbon dioxide, methane and a number of others. These are the 'greenhouse gases' we hear so much about. Water vapour is the most important greenhouse gas in terms of its effect. However, the greenhouse gas that is attracting the most attention is carbon dioxide.

If the greenhouse effect is natural ... what is all the fuss?

Since the beginning of the Industrial Age around 300 years ago, many human activities have involved the burning of fossil fuels. We burned wood to warm our homes for

centuries, but with the Industrial Revolution we began to burn wood, coal and oil to drive our industries and transportation systems. One of the main by-products from the burning of fossil fuels is carbon dioxide. Since the 1700s, the amount of carbon dioxide in the atmosphere has increased by 25%.

The concern is if we continue to add greenhouse gases to the atmosphere as a result of our activities, then the atmosphere may absorb more heat and so cause the temperature to rise. This is also known as the "*enhanced greenhouse effect*". This is the simple view of the situation.

The reality is that we really do not know what the exact causes and effects of adding greenhouse gases to the atmosphere will be.

In 1995, a United Nations group, the Intergovernmental Panel on Climate Change (IPPC), released their second major report on the situation. They stated in that report: "*the balance of evidence suggests a discernable human effect on the climate*".

Many scientists believe that human activity is raising the amount of greenhouse gases in the atmosphere. By increasing the concentrations of these gases, we may affect our climate, specifically the temperature and precipitation patterns around the globe. Since the climate system is very complex, it is difficult to predict with any certainty the exact results of the increasing greenhouse gases in the atmosphere.

Scientists use very complex computer models to try and predict the effects of increased levels of greenhouse gases in the atmosphere. Overall, the models predict a global rise in temperature. As sophisticated as the models are, they are still unable to accurately predict possible regional and local effects.

What are the possible effects of climate change in Alberta?

Ask an Albertan in February if warmer temperatures would be a good thing. One of the regional effects may be a warmer winter for the Prairies. Some studies suggest that our maximum temperatures may not increase a great deal, but the daily minimum temperatures may be warmer than we now experience.

Another concern is with our precipitation patterns. Increased temperatures may lead to changes in our rain and snowfall. Warmer temperatures may lead to more periods of drought in the southern prairies. This in turn will affect which crops can be successfully grown. A change in climate may allow for other crops, such as corn, to be introduced into areas where they cannot be grown at present. Longer periods of drought may mean more problems with insects and diseases that affect our crops. Such changes may influence our production of food and the economic state of our province.

Shorter winters could affect the recreation industry with shorter ski seasons. On the other side, this may also mean a longer summer, which would extend the golf season. A warmer climate could affect our water quality, especially in lakes used for recreation and water supply.

A warmer climate may affect our forests. Along the southern edge of the boreal forest, the native trees may not be able to survive in the warmer, drier conditions and other species may take their place. The northern border of the boreal forest may extend northward as conditions change. As their habitat changes, wildlife may move out of some areas and into new regions.

The main word in all this is *change*. We know that the climate varies naturally, but now we think that our actions may be having an effect. Climate affects almost everything in our lives. It is not only change that we have to be concerned with, but also the *rate of change*. If our activities cause the climate to change faster it would naturally, there is a great concern that we will have to adapt quite quickly to the effects of these changes. Changes that may have taken centuries under natural conditions could possibly occur faster. Our ability to successfully adapt to these changes will affect our economy, our lifestyle and our environment.

So what can we do about climate change?

Since most human-produced greenhouse gas emissions are associated with energy production and use, this is the place to start.

You can make a difference if you consider energy use and conservation in your daily activities.

- ☑ Make sure your heating system and vehicle are in good repair.
- ☑ When purchasing a vehicle, choose the right size and power for your needs. If you have a large family, then a van may be the right choice. If you use a truck once or twice a year, consider borrowing or renting rather than buying. A large engine may be necessary if you tow a trailer, but if most of your driving is just around the city, think about a smaller vehicle.
- ☑ If you are going to purchase new appliances, look at the energy ratings that are displayed on all new appliances. It may cost a little more to purchase an energy efficient model, but in the long run you will save money and energy.
- ☑ Make sure your house is properly insulated so your heating system doesn't have to work as hard.
- ☑ Learn about the issue of climate change. There is a lot of information available to allow you to make informed choices about your impacts.
- ☑ Think about your activities and what effect they are having on the environment.

Energy efficiency not only will help reduce our emissions of greenhouse gases, but can also save you money – it's a win for you and the environment.

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